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TITLE: Continuous sheet-shaped and crosslinked fluoro:resin
foam used for sealing material, etc. - is prepared by
crosslinking and foaming a poly(vinylidene fluoride)
mixture containing two types of poly(vinylidene fluoride)

----- KWIC -----

Basic Abstract Text - ABTX (1):

A continuous sheet-shaped and crosslinked fluoro:resin foam (X) is prepared by crosslinking and foaming a poly(vinylidene fluoride) (PVDF) mixture consisting of 95-50 wt.% of PVDF (A) and 5-50 wt.% of PVDF (B) having a melting temperature of 30-200 deg. C more than that of PVDF (A) and has a hardness at 25% compression of 0.2-5 kg/cm², a mouldability (L/D) of 0.3-0.8, a flame resistant oxygen index of more than 35, a crosslinking ratio of 20-70%, and an expansion ratio of 300-5000%.

Basic Abstract Text - ABTX (3):

ADVANTAGE - (X) has high surface evenness, expansion ratio, compression strength, flame resistance, and abrasion resistance.

PATENT ABSTRACTS OF JAPAN

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(54) CONTINUOUS SHEETLIKE FLUORINE-BASED RESIN CROSS-LINKED FOAM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain the subject foam excellent in sheet forming properties, cross-linking efficiency by radiation, surface smoothness, fine and uniform in foam structure and high in expansion ratio, comprising specific fluorine-based resins.

SOLUTION: This foam is obtained by expanding the cross-linked material of a foamable sheet comprising (A) a polyvinylidene fluoride-based resin and (B) a fluorine-based resin having a melting point higher than that of the component A by 30-200°C in the blending ratio of the component B/(the components A+B) of 0.05 to 0.5 and has 0.2-5kg/cm² 25% compression hardness, 0.3-0.8 moldability (L/D), ≥ 35 flameretardant oxygen index, 20-70 % cross-linking degree and 3-50 times expansion ratio. Preferably, the component A is a copolymer resin of vinylidene fluoride and tetrafluoroethylene and the copolymerization ratio is 95/5 to 70/30. Consequently, the objective effects can be obtained while retaining the characteristics of a fluorine based resin.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to continuation sheet-like fluororesin bridge formation foam.

[0002]

[Description of the Prior Art] Generally, since it excels in fire retardancy, thermal resistance, chemical resistance, solvent resistance, abrasion resistance, and non-adhesiveness, fluororesin foam is widely used as a sealant, packing material, gasketing, a heat insulator, and an elastic roll cladding material.

[0003] Conventionally, fluororesin foam as indicated by JP,54-41969,A, the 59-11340 official report, the 62-112637 official report, and the 62-280236 official report An inorganic system foaming nucleating additive and a decomposable blowing agent are added to fluororesin. Extrude it, and foam to it or or foam instead of a decomposable blowing agent using a fluorine system volatilization mold foaming agent, or or after fabricating the fluororesin which blended the decomposable blowing agent beforehand in the shape of a sheet, make a bridge construct by the electron ray or the radical part solution method, foam, or Or after fabricating fluororesin in the shape of a sheet and making a bridge construct by the electron ray or the radical part solution method, the approach of foaming and acquiring is proposed by carrying out pressurization sinking in, heating-pressurizing and discharging pressure into a volatilization mold foaming agent.

[0004] However, in order to obtain continuation sheet-like high expansion ratio foam, a specific approach, i.e., a foaming agent, is blended and it is restricted to the approach of foaming to extrusion molding and coincidence in the shape of a continuation sheet, or the approach of foaming, after fabricating in the shape of a continuation sheet. Since in the case of the latter approach the melting point is 200 degrees C or more especially except specific fluororesin and melt viscosity is very high, in the usual organic system chemistry foaming agent, a foaming agent decomposes into sheet forming and the foam by which the diameter of air bubbles was controlled by altitude is not obtained. Moreover, since whenever [this stoving temperature] is the temperature which produces disassembly of the diameter resin of a fluorine although sufficient expansion ratio is not obtained if foaming temperature is made higher 30-100 degrees C than the decomposition temperature of a foaming agent and rapid decomposition is not usually carried out, although decomposition temperature is proposed by the official report of the above [also using the pyrolysis mold foaming agent which is 260-320 degrees C], a product is not obtained substantially. Continuation sheet-like foam is not obtained by the other well-known approaches and the approach of sinking in and foaming to a volatilization mold foaming agent.

[0005] Thus, with the above well-known techniques, the continuation sheet-like foam of high expansion ratio which has detailed and uniform cellular structure had the fault that the product which was obtained and was stabilized [it was hard and] was hard to be obtained.

[0006]

[Problem(s) to be Solved by the Invention] The technical problem of this invention conquering the above conventional faults, and holding the description of fluororesin, such as fire retardancy, thermal resistance, chemical resistance, solvent resistance, abrasion resistance, and non-adhesiveness, it excels in surface smooth nature, and it is to offer the fluororesin bridge formation foam of the shape of a continuation sheet of high expansion ratio which has detailed and uniform air bubbles.

[0007]

[Means for Solving the Problem] Without having excelled in the sheet moldability by blending using specific fluororesin, as a result of inquiring wholeheartedly, in order to conquer the conventional fault, and the bridge formation effectiveness by the radiation having been good, and thermal resistance falling, it excels in surface smooth nature, and this invention persons came to complete header this invention for the fluororesin bridge formation foam of the shape of a continuation sheet of high expansion ratio which has detailed and uniform cellular structure being obtained.

[0008] Namely, the continuation sheet-like fluororesin bridge formation foam concerning this invention It consists of polyvinylidene fluoride system resin (A) and fluororesin (B) with the melting point higher 30-200 degrees C than polyvinylidene fluoride system resin (A). Foamed in the bridge formation object of the fizz sheet whose the combination (system B) / (A+B) are 0.05-0.5. 0.2-5kg/cm² and a moldability (ratio of length to diameter) are characterized [compressive hardness / 35 or more and a degree of cross linking] by being 3 to 50 times the expansion ratio of this by

0.3 to 0.8, and the fire-resistant oxygen index 20 to 70% 25%. The thermal resistance excellent in the surface smooth nature in which this foam does not have a surface cellular dry area by the below-mentioned measuring method has 3% or less of property.

[0009]

[Embodiment of the Invention] The melting point of the polyvinylidene fluoride system resin (A) used for this invention is 125-170 degrees C at least, and MI (Melt Flow Index) is compounded by the emulsion-polymerization method in 2g - 100g / 10 minutes. It is specifically the copolymer of polyvinylidene fluoride resin, vinylidene fluoride, and tetrafluoroethylene, and the copolymerization ratio is the thing of 95 / 5 - 70/30, and the resin in which electron ray bridge formation is [having no bridge formation assistant and] possible is illustrated.

[0010] On the other hand, various kinds of fluororesin is illustrated from (A) that the fluororesin (B) with the melting point high 30-200 degrees C should just be resin other than what was used as a (A) component. For example, although it may be polytetrafluoroethylene, ethylene, a tetrafluoroethylene copolymer, etc. and electron ray bridge formation may not necessarily be [having no bridge formation assistant and] possible, polytetrafluoroethylene is the most desirable especially.

[0011] MI of polyvinylidene fluoride system resin (A) -- 2g-100g/-- they are 5g - 50g / 10 minutes preferably for 10 minutes. Since fly off increases from the front face of foaming gas and surface smooth nature is spoiled while the mechanical strength of foam falls since the foaming agent which MI blended in 2g / less than 10 minutes at the time of the melting extrusion at the time of fizz continuation sheet forming since melt viscosity was high decomposes, and it becomes impossible to obtain the foam of uniform detailed air bubbles, and the molecular weight of resin will become small if 100g / 10 minutes are exceeded preferably, it is not desirable. Although this being extremely good on the other hand compared with the suspension-polymerization method the bridge formation effectiveness by the electron ray being the polymerization method of another side although being compounded by the emulsion-polymerization method is desirable as for this resin, and a reason are not certain, they are indispensable to acquire the property beyond [, such as heat-resistant improvement after considering as the foam which is the purpose of this invention,] the effectiveness derived from the only mixed raw material.

[0012] It is desirable to use the copolymer of vinylidene fluoride and tetrafluoroethylene as polyvinylidene fluoride system resin (A), and, as for the copolymerization ratio, it is desirable to use the thing of 95 / 5 - 70/30. This is effective in order to control the melting point by changing a copolymerization ratio, to suppress disassembly of the foaming agent by the shear heating at the time of the sheet manufacture for foaming and to obtain the stable product. It is in the inclination for the bridge formation effectiveness in an electron ray to get worse remarkably while the melting point will rise conversely if this copolymerization ratio becomes as practically equal as a polyvinylidene fluoride resin independent less than at 95/5 in the melting point itself, there is no advantage in respect of melting point control and copolymerization is carried out exceeding 30 on the other hand, and resin flowability gets worse sharply.

[0013] In this invention, the (rate B) of combination / (A+B) of polyvinylidene fluoride system resin (A) and fluororesin (B) with the melting point higher than (A) are 0.05-0.5, and is 0.1-0.4 preferably. Since it will improve about thermal resistance or chemical resistance if 0.5 is exceeded on the other hand preferably, since the effectiveness of the (B) component is small at less than 0.05 and the rate of combination is inferior to thermal resistance, it is desirable, but the rise of the melt viscosity of a resin presentation is intense, and since disassembly of the foaming agent by the shear heating at the time of the sheet manufacture for foaming arises, it is not desirable.

[0014] What mixed acrylate (meta) system resin five to 20% of the weight in this invention in the mixture 100 weight section of polyvinylidene fluoride system resin (A) and fluororesin (B) can also be used. (Meta) Since the constituent which mixed acrylate can obtain the sheet excellent in smoothness, without taking special cooling conditions since a melt flow rate and the crystallization rate at the time of sheet-izing can be made late, it is desirable. Although the mixing percentage of polymethylmethacrylate resin is desirable in respect of thermal resistance at less than 5 % of the weight at this time, a melt flow rate gets worse, or control of a crystallization rate becomes difficult and it is hard to obtain a smooth sheet. On the other hand, although it is desirable in respect of a sheet moldability when 20 % of the weight is exceeded, it is in the inclination for thermal resistance, fire retardancy, and a moldability (ratio of length to diameter) to get worse. since a melt flow rate is markedly easy to be alike compared with the aforementioned independent resin or copolymerization resin, and a mixed resin presentation and the crystallization rate at the time of sheet forming is controlled, the cooling condition range becomes large, and what mixed these three resin becomes easy to obtain a smooth sheet, although a reason is not certain.

[0015] As for the foam by this invention, 0.3 to 0.8 and a fire-resistant oxygen index have [compressive hardness / 35 or more and a degree of cross linking / expansion ratio] 0.2-5kg/cm² and a moldability (ratio of length to diameter) in the range which is three to 50 times 20 to 70% 25%. 25% compressive hardness is 0.2kg/cm². Although it is a soft value low as compressive hardness in the following, since fluororesin foam is resin with rigidity, it is lacking in recoverability, the so-called "permanent set in fatigue" is produced and gestalt holdout gets worse, they are another side and 5kg/cm² preferably. Since rigidity will become remarkable and the buffer nature as foam will fall if it exceeds, it is not desirable.

[0016] Moreover, although it is used taking advantage of the thermal resistance and fire retardancy which are the description of fluororesin, fabricating by various kinds of fabricating methods, since a moldability (ratio of length to diameter) cannot respond to a complicated configuration, this foam does not have it. [desirable at less than 0.3] Since it becomes extremely thin depending on the configuration of mold goods, and a gestalt cannot be held but reinforcing materials will be used on the other hand when 0.8 is exceeded, it is not desirable.

[0017] Since it comes to burn with an ignition phenomenon about the flammability of the field from which a fire-resistant oxygen index is asked for electric insulation and advanced fire retardancy less than by 35 in the foam of this invention at coincidence not only in an emitting smoke phenomenon but in an elevated-temperature field, it is not desirable.

[0018] In the foam of this invention, although a degree of cross linking is desirable in respect of fabrication nature at less than 20%, since the cellular tear by the fly off of the foaming gas from the foam front face started since the degree of cross linking is low arises, it is not desirable. On the other hand, since it will improve about thermal resistance and tensile strength if 70% is exceeded, it is desirable, but since tension elongation falls and a moldability falls as a result, it is not desirable.

[0019] Moreover, since winding by the shape of a roll becomes difficult and cannot supply by the shape of a continuation sheet substantially even if expansion ratio becomes remarkable [rigidity] in less than 3 times and it is obtained in the shape of a continuation sheet, it is not desirable. On the other hand, since the cellular film of foam will become extremely thin if 50 times are exceeded and a fall and moldability of a mechanical strength fall, it is not desirable.

[0020] Furthermore, if the rate of a heat shrink under 150 degrees C is not specifically 5% or less, since thermal resistance and the field used will be restricted, the foam of this invention is not desirable.

[0021] As for the organic compound foaming agent used for this invention, it is desirable to use a thing with the decomposition temperature of 190-240 degrees C. Since an environment is polluted by fluorine system gas high [which was produced in that decomposition arises in fluororesin at this temperature since whenever / stoving temperature / at the time of foaming / will become about 300-350 degrees C, if 240 degrees C is exceeded on the other hand preferably, since decomposition is conjointly produced with generation of heat in the shear at the time of the extrusion from the height of heat capacity with decomposition temperature peculiar / a less than 190-degree C thing / to a fluororesin and foam good / of smoothness / is not obtained, and decomposition / corrosive], it is not desirable especially. Specifically, an AZOJI carvone amide, an azo dicarboxylic acid metal salt, dinitrosopentamethylenetetramine, etc. can be used.

[0022] Additives, such as the fines bulking agent of an inorganic system, a coloring agent, an antistatic agent that consists of a fluorochemical surfactant, a thio system, a hindered phenol system thermostabilizer, and a hydronalium aromatic hydrocarbon compound, may be added by the foam of this invention in the range which does not spoil the property of foam.

[0023] In this invention, although foam needs to construct the bridge and the radiation-induced crosslinking method performed by irradiating an ionizing radiation as the bridge formation approach can be used, it can also carry out by using peroxides, such as peroxide, together. The amount of radiation irradiation has the desirable range of 5 - 30Mrad.

[0024] Various kinds of approaches can be applied to the foaming approach of the foam by this invention, and the hot blast foaming method, the drug solution bath top foaming method, etc. are specifically mentioned to it. Moreover, after rolling round the foam by this invention in the shape of a continuation sheet, it can also raise properties, such as thermal resistance, rigidity, and reinforcement, further by carrying out annealing for 24 hours at temperature lower 20 degrees C or more than the melting point of resin.

[0025] Next, an example of the manufacture approach of the continuation sheet-like fluororesin bridge formation foam by this invention is explained. The **** ratio of vinylidene fluoride and tetra-FURORO ethylene as polyvinylidene fluoride system resin to 140kg of 70/30 of copolymerization resin powder, and 35kg of fine powder of polytetrafluoroethylene As talc 3kg whose particle size is 0.3-3 micrometers, and a decomposable blowing agent, AZOJI carvone amide 8kg, 1010 [0.5kg] is prepared as a thermostabilizer and it supplies to a Henschel mixer, and homogeneity distribution was mixed and carried out, taking care that a mixer is rotated and temperature does not go up to 80 degrees C or more. It introduced into the extruder with a vent which heated this mixed raw material to the temperature which a foaming agent does not decompose, extruded from the T die set, and cooled quickly with the 20-degree C cooling roller, and it was made the shape of a continuation sheet whose width of face is 500mm whose thickness without the air bubbles by air entrainment is 1.3mm, and rolled round.

[0026] When it carried out to the bridge formation which performed electron beam irradiation on this sheet, and was suitable for foaming, i.e., foam, the electron ray was irradiated and bridge formation was given so that a degree of cross linking might become 20 - 80%. This sheet was continuously introduced into the ** type hot blast foaming furnace of temperature higher 30-100 degrees C than the decomposition temperature of a foaming agent, and the hot blast heating method specifically heated at 250 degrees C, and was made to foam at it.

[0027] Thus, thickness was [3.0mm and the width of face of the obtained foam] foam of the shape of a continuation sheet of a front face 2.7 times the crosswise scale factor [one 3.2 times the die-length direction scale factor / 20 times and / of this, and] of this with smooth 1300mm and expansion ratio.

[0028] this foam -- for 1.05kg/cm² and a moldability (ratio of length to diameter), 0.72 and a fire-resistant oxygen index were [25% compressive hardness / 45 and the degree of cross linking of the 150-degree C dimensional change / each direction] 3% or less of foam 47%.

[0029] Although the reason of a manifestation of the effectiveness by this invention is not certain, I think that it solves, fluoro-resin is fixed by the network chain of vinylidene fluoride resin since [which resin copolymerized apparently] micro-disperse was carried out and the bridge was further constructed with the fusion gestalt, therefore the thermal resistance more than the melting point of vinylidene fluoride resin is obtained due to the compatibility of vinylidene fluoride resin and fluoro-resin.

[0030] The continuation sheet-like fluoro-resin foam by this invention Resiliency, high fire retardancy, The description of adiathermic and a moldability, the electrical property of resin original, especially low dielectric constant nature are harnessed. Electric relation, such as computer wiring covering (spread-of-a-fire prevention material) and wire covering material, The abrasive cloth for precision polish, the air-conditioning duct heat insulator of a **** train or the aircraft (spread-of-a-fire prevention material), The light weight simple rolling fire door which carried out composite molding to car engine room diaphragms, such as an automobile, and a metal plate, It can be adapted for various kinds of fields with a composite article with a metal plate, the metal foil, a film, an inorganic fiber, etc., such as an inorganic fiber mat, stuck backing material for noncombustible boards, or pipe covering, as an object for nuclear-electric-power-generation-related radiation exposure section heat insulation.

[0031] The measuring method in [measuring method and valuation-basis] this invention and the valuation basis are as follows.

(1) The value measured according to 25% compressive hardness JIS-K6767 was used.

[0032] (2) the moldability diameter of 5cm -- the depth (L) -- a diameter (D) -- receiving -- 0.2, 0.4, 0.5, 0.6, and 0. -- with the vacuum forming machine equipped with the metal mold of the shape of a cup set as the ratio of 7 and 0.8, the vacuum forming was carried out and heating and the ratio (ratio of length to diameter) fabricated without tearing foam were made into the valuation basis of a moldability at 200-280 degrees C.

[0033] (3) The value measured by 2863 to fire-resistant oxygen-index ASTM-D70 law was used.

[0034] (4) Carry out beating of the degree-of-cross-linking foam, and weigh it precisely 0.2g. It cools naturally until heat for 3 hours, make a dissolution part dissolve, take out insolubles, and an acetone washes, pure water after removing a tetralin washes, it removes an acetone, 120-degree C hot air drying equipment removes moisture and it becomes a room temperature, being immersed into a 150-degree C tetralin and stirring this thing. The weight (W1) g of this thing is measured, and it asks for a degree of cross linking by the degree type.

Degree-of-cross-linking = $(W1 / 0.2) \times 100 (\%)$

[0035] (5) Start 10x10cm from the sheet for expansion ratio foaming, and it is thickness t1. (cm) and weight W1 (g) is measured and a sheet consistency is computed by the degree type.

Sheet consistency (Srho1) = $W1 / (10 \times 10 \times t1) (g/cm^3)$

Furthermore, 10x10cm is started from foam, and it is thickness t2. (cm) and weight W2 (g) is measured and the consistency of the foam of this invention is computed by the degree type.

Foam consistency (Frho1) = $W2 / (10 \times 10 \times t2) (g/cm^3)$

Expansion ratio is computed by the degree type from the above-mentioned sheet consistency and a foam consistency.

Expansion ratio = $Srho1 / Frho1$ (twice)

[0036] (6) It measured based on MIASTM-D -1238-70 (under 5kg load and 230 degrees C).

[0037] (7) It is the ink undiluted solution of a magic marker 10cm to the front face of surface smooth nature foam 2 It wipes off with gauze after spreading above, and the ink remaining condition of the front face after wiping is judged on the following criteria.

O : 10cm² O by which ink does not remain in a front face at all : 10cm² ** which has 1-5 ink in the surface cellular tear section: 10cm² x which has five or more ink in the surface cellular tear section : Consider as success more than O that has ink in the whole front face of 10cm².

[0038] (8) Start a 15x15cm sample from heat-resistant foam to accuracy, after measuring thickness, measure each dimension and measure the rate of change before and behind processing, after putting into 150-degree C hot blast oven, heating for 1 hour and cooling at ejection and a room temperature for 2 hours. The rate of change of length, width, and thickness makes 5% or more a rejection.

[0039]

[Example] Next, this invention is explained based on an example.

Fine powder 180kg of example 1 polyvinylidene-fluoride system resin (7200 melting point: MI:15g / [125 degrees C and], 10 minutes, product made from ATOchem), To tetrafluoroethylene ("full ORON" G190, Asahi FURORO polymer company make) 40kg, the AZOJI carvone amide (3 AC- # Nagakazu formation product made from Mining) 12 weight section, Mixed distribution of the talc (LM-R classification article mean particle diameter: 1.0-micrometer, product made from Tsuchiya Kaolin) 2 weight section is carried out with a Henschel mixer. this thing -- with a vent -- it introduced into

65mmphi twin screw extruder heated at 185 degrees C, and extruded from the T die with which it was equipped, and the sheet for foaming with the thickness of 1.5mm, a width of face [of 500mm], and a die length of 450m non-constructed a bridge was created with 108-degree C polishing drum shaping equipment.

[0040] The electron ray of 3.5Mrad(s) was irradiated and was made to construct a bridge over this sheet from both sides. It introduced into the silicone drug solution foaming tub which heated this sheet at 220-235 degrees C continuously, and foamed to it, and the continuation sheet-like foam of the-seven roll of 200m die length was obtained as continuation sheet-like foam. The property of this product was shown in Table 3.

[0041] Using a component as shown in one to examples 2-5 and example of comparison 5 table 1, it considers as foam by the approach as shown in Table 2, and the property of the obtained foam is shown in Table 3.

[0042] Thus, the foam by this invention which showed each example was fluororesin bridge formation foam excellent in the fire retardancy which stood high while the thermal resistance in 150 degrees C improved, although it became continuation sheet-like foam of detailed and uniform cellular structure and the melting point of frame resin was low, resiliency, and fabrication nature.

[0043] In what, on the other hand, depends the fluorine system bridge formation foam shown in each example of a comparison on the well-known approach, the continuation sheet-like foam by this invention was what is hard to be obtained and cannot satisfy fire retardancy, resiliency, fabrication, surface smooth nature, thermal resistance, etc.

[0044]

[Table 1]

	樹 脂 名	混合比率	樹脂総配合量 (重量部)
実施例 2	(A) フッ化ビニリデン-テトラフロロエチレン共重合体 (共重合比70/30、融点:125℃、MI:8)	0. 3	2 4 5
	(B) エチレン-テトラフルオロエチレン共重合体 (融点:267℃、MI:35 (at297℃))		1 0 5
実施例 3	(A) ポリフッ化ビニリデン (融点:168℃、MI:10)	0. 1	3 2 2
	(B) ポリテトラフルオロエチレン (融点:327℃)		3 6
実施例 4	(A) フッ化ビニリデン-テトラフロロエチレン共重合体 (共重合比70/30、融点:125℃、MI:8)	0. 5	1 7 6
	(B) ポリフッ化ビニリデン (融点:168℃、MI:10)		1 7 6
実施例 5	(A) ポリフッ化ビニリデン (融点:168℃、MI:10)	0. 2	2 5 2
	(B) エチレン-テトラフルオロエチレン共重合体 (融点:320℃、MI:35 (at297℃)) ポリメチルメタクリレート		6 3 2 0
比較例 1	(A) ポリフッ化ビニリデン (MI:70)	0.	3 5 0
	(B) —		0
比較例 2	(A) —	0	0
	(B) エチレン-テトラフルオロエチレン共重合体 (融点:320℃、MI:35 (at297℃))		3 4 5
比較例 3	(A) ポリフッ化ビニリデン (MI:10)	0. 7	1 0 5
	(B) フッ化ビニリデン-テトラフロロエチレン共重合体 (共重合比50/40、MI:15)		2 4 5
比較例 4	(A) フッ化ビニリデン-テトラフロロエチレン共重合体 (共重合比70/30、MI:5)	0. 9	3 5
	(B) ポリテトラフルオロエチレン (融点:327℃)		3 9 2
比較例 5	(A) エチレン-テトラフルオロエチレン共重合体 (融点:320℃、MI:35 (at297℃))	0. 4	1 9 8
	(B) ポリテトラフルオロエチレン (融点:327℃) アクリル樹脂		1 6 4 2 0

フッ化ビニリデン系樹脂の比重 : 1. 7 5
エチエン-テトラフルオロエチレン共重合体の比重 : 1. 7 8
ポリテトラフルオロエチレンの比重 : 2. 1 8
その他樹脂の比重 : 1

[0045]

[Table 2]

	発泡剤 添加量	シート厚み (mm)	電子線照射量 (Mrad)	発泡方法
実施例2	アゾジカルボンアミド 16重量部	2.2	16.3	薬液浴上発泡
実施例3	アゾジカルボンアミド 10重量部	1.5	6.5	薬液浴上発泡
実施例4	アゾジカルボンアミド 24重量部	2.5	18.5	薬液浴上発泡
実施例5	アゾジ12ボンアミド 12重量部	2.0	14.9	縦型熱風発泡
比較例1	アゾジカルボンアミド 10重量部	1.0	8.2	縦型熱風発泡
比較例2	アゾジカルボンアミド 6重量部	2.2	25.0	薬液浴上発泡
比較例3	アゾジカルボンアミド 12重量部	4.0	8.3	薬液浴上発泡
比較例4	アゾジカルボンアミド 5重量部	1.5	21.8	オイルバス発泡
比較例5	アゾジカルボンアミド 12重量部	2.0	8.0	縦型熱風発泡

[0046]

Table 3

	厚み (mm)	発泡倍率 (倍)	架橋度 (%)	25%圧縮硬さ (kg/cm ²)	成形性 (L/D)	難燃性 酸素指数	表面 平滑性	150℃耐熱性 (%)
実施例1	4.5	40	35	0.69	0.60	57	◎	0.0
実施例2	4.0	15	20	1.89	0.60	48	◎	0.0
実施例3	3.0	8	58	4.00	0.70	54	◎	0.0
実施例4	2.5	35	30	0.98	0.70	43	○	3.0
実施例5	0.8	13	45	2.30	0.80	38	◎	4.1
比較例1	4.5	7	78*	5.20	(0.20)	43	○	2.5
比較例2	フォームならず*	発泡せず*	0*	—*	—*	—	×	0.0
比較例3	3.5	7	35	6.60*	0.50	72	○	2.5
比較例4	4.8	2.5*	18*	6.10*	0.60	53	×	0.0
比較例5	フォームならず*	発泡せず*	0*	—*	—*	—*	×	0.0

*印は不満足点

[0047]

[Effect of the Invention] As explained above, according to the continuation sheet-like fluoro-resin bridge formation foam of this invention, the foam which was excellent in surface smooth nature and was excellent in the compressive hardness of high expansion ratio which has uniform cellular structure, a moldability, fire retardancy, and abrasion resistance can be obtained.

[Translation done.]